Engineering & Design Standards

Edits to 2019 Edition for New 2021 Public: Changes in blue to be highlighted at the MARCH 3, 2021 Development Advisory Forum
Changes in red made as a result of review comments (posted for review March 9 to April 5, 2021)
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Section/Chapter	Topic	Changes
Preface		added a.k.a. Engineering Procedure Manual
1	City Engineer's Authority	Added citation of City Code where City Engineer's authority to establish standards.
105.25.1	Master utility sheet	The Master Utility Sheet shall show and call out all proposed points of connection to existing public water and sewer systems. Added to 105.25.1
105.26.2	Detail sheets	Add link to website address for standard details.
105.27.1	Design sheets	added "and signed"
Figure 1.2	Certification letter	minor text corrections
204.3	Signing & Marking Design	Signing & Marking Design procedures added. These requirements were formerly included in a separate document.
204.4	Traffic Impact Study	Traffic Impact Study guidelines added
211	Sight visibility triangles	Added link to Figure 2.3 for guidelines in determining SVT at intersections and driveways.
217.3	Transit facilities	Updated text:...new right-of-way shall be required that includes the paved portion of the bus-bay, required ADA complaint bus boarding/alighting area, transit shelter and site furnishings (if required), curb, gutter, and sidewalk unless otherwise approved by the City.
217.4	Transit facilities	Replaced "park and ride centers" with "park & rides, and transit centers"
217.4	Transit facilities	Replaced "district circulators" with "neighborhood circulators"
217.4	Transit facilities	Removed reference to Bus Rapid Transit (BRT), Mesa does not have this type of service
221	City Communication Conduit & Fiber Optic Cable	Add Section formalizing requirements for communication conduit
Chapter 3; 307.4	Water sampling stations	Water sampling stations are required in all new residential subdivisions consisting of twenty or more platted lots. Developers shall contact the Water Quality Division prior to the preliminary plat submittal for a determination. Sampling stations are to be located within public right-of-way or public utility easement, 3 feet behind the sidewalk. Large developments constructed in phases will be required to install the sampling station on the first phase and each subsequent phase when the overall number of dwelling exceeds 300, or as requested by the Water Quality Division.
317.3	Water sampling stations	Added: Water sampling stations are required in all new residential subdivisions consisting of twenty or more platted lots. Sampling stations are to be located within public right-of-way or public utility easement, 3 feet behind the sidewalk. Developments constructed in phases will be required to install the sampling stations on the first phase and each subsequent phase, or as requested by the Water Quality Division. Developers shall contact the Water Quality Division prior to the preliminary plat submittal for a determination.
304.1	Code requirements	Added to the end of 304.1: Any and all more stringent requirements shall take precedence.
312.5	Flow tests	Added: Fire hydrant flow tests used for calibrating hydraulic models must be less than one year old. Reviewer Note: This is required by NFPA for fire flow hydraulic analysis.
315.1	Water design standard	minor text edits
315.1	Water design standard	minor text edits
316	Public Water Distribution &	Revised section title
316.4	Access	Revised text to say that an access path is required. The access path shall provide unobstructed vehicular access, have a minimum width of 12 feet, and shall be paved
316.4	Access path maintenar	Added to the end of 316.4: Maintenance of the access path is the responsibility of the property owner, their representative or governing homeowner's association.

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316.4	Water easements	Added a paragraph under 316.4: Easements shall be free of obstructions, shall not be in fenced areas and shall be accessible by City staff at all times. Easements outside of paved areas shall have cross-sectional slopes no greater than 10% and longitudinal slopes no greater than 20%. Easements must be suitable for accommodating trucks, backhoes and other related equipment necessary for the proper maintenance of water mains. For dead-end configurations, a hammerhead turnaround or other approved configuration shall be provided. Provide a minimum turn radius of 45 feet. Reviewer Note: Turn around sizing should be checked against Mesa Fire Department standards.
316.5	Water main stationing	Added a bullet point item to 316.5: Station water mains along street monument line or pipe centerline.
316.5	Water line plan sheets	Plan sheets are to include trees and hardscape,easements, rights-of-way
316.6	Waterline profiles	Waterline profiles need to show existing and proposed ground along pipe centerline
316.10.2	Water mains outside pressure zone	Revise text to say: When public water mains are located outside of their intended pressure service zone, the construction plans shall clearly indicate which pressure zone the main is intended to serve.
316.10.3	Water mains outside pressure zone	Revised text to say: pressure zones shall be placed in the concrete ring adjacent to the valve. Caps shall be constructed of red brass or bronze, with lettering conforming to MAG Standard Detail 120.
316.10.3		Changed 'markers' to 'caps'.
316.11	Water main location	Revised paragraph to: 316.11.1 Public water mains that are to be installed in public easements on private property are to be located under pavement. Water mains shall be located in the center of public easements and centered in private drive aisle(s). Water mains shall not be located less than 5 feet from the edge of the easement. Installation of public water mains under parking stalls, colored concrete, pavers, specialty pavement, raised medians, bus shelters, permanent structures of any kind, or landscape areas are prohibited. Areas in question must be approved in writing by the Water Resources Department.
316.11	Swing ties	Add reference to swing tie detail
316.12.1	minimum cover increased to 60" over >12" pipe	Revised minimum cover over pipes > than 12" to sixty inches (60") minimum cover Reviewer Note: Operating nuts on valves need to be 2' deep from finished grade and the current 48" minimum pipe depth isnt sufficient for 16" pipe to meet that requirement.
316.13	Minimum cover over valves	Revised text: 316.12.6 The stated public water line depths in Section 316.12 are minimums. Public water lines shall be designed at depths sufficient to provide a minimum of 2 feet of cover from finished grade to the top of operating nuts on valves that are installed in the vertical position.
316.16	Minimum separation between utilities	Revised and reorganized this section regarding minimum separation.
316.17	Minimum separation between utilities	Revised and reorganized this section regarding minimum separation.
316.17	Application of Plumbing code	Renumber to 316.18.
316.18	Minimum separation between utilities	Moved this to section 316.16.5
316.19	Vertical water main realignment	Revised sizes to which MAG 370 applies, to be in line with the detail. Max size revised from 16" to 12". Reviewer Note: MAG details only fully cover pipe realignment and anchor/thrust blocks for 12" and smaller pipe.

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316.19	Sealed Restraint length and anchor block calculation for pipes greater than 12" must be provided for review and approval.	Added to the end of 316.19: Vertical realignments on existing pipe may require anchor blocks to be designed and installed, and for the purposes of calculating restraint lengths or anchor block sizing, the design engineer shall not assume that the existing pipe is restrained. For anchor block sizing on pipe sizes through twelve inches (12"), M.A.G. Standard Detail 381 shall be used. The design engineer shall submit sealed and signed calculations for anchor blocks designed on pipe sizes greater than twelve inches (12").
316.20	Corrosion monitoring/protection designs	Added to section 316.20: Corrosion monitoring and protection designs shall be included in the approved project plans and specifications. No deferred design submittals are allowed.
316.20.5	Corrosion monitoring/protection designs	minor clarification
316.20.5	Corrosion monitoring/protection designs	Added the following bullet point items: - Corrosion test stations shall be shown in plan view with stationing and offsets for each location. Upon project completion, the as-built location of each test station shall be correctly shown on the record drawings. - Where possible, test stations shall be located outside of pavement behind the curb and sidewalk.
316.20.5	Corrosion test stations	Revised text to say test station lids are to say "CTS WATER". Lettering to be integrally cast or stamped.
316.22.1	Thrust restraint	Change section to 316.23.1 and minor modification
316.22.1	Clarification of thrust restraint requirements	Added the following items to 316.22.1: - For connections to existing mains, upstream buried piping shall be considered unrestrained for design purposes, regardless of pipe material. Thrust blocking per M.A.G. Standard Details 380 and 381 shall be utilized as required to properly restrain existing piping impacted by proposed connections. - Thrust restraint per M.A.G. Standard Detail 303-1 and 303-2 applies only to sections of new ductile-iron pipe installations. Where restraint lengths per Detail 303-2 extend beyond the reach of new ductile-iron pipe sections, thrust blocks and anchor blocks are required to prevent pull-out of existing, adjacent piping. - Anchor blocks for vertical bends shall be per M.A.G Standard Detail 381 for water mains up to and including twelve inches (12") in diameter. For anchor blocks on pipe larger than 12", sealed details and calculations are required to be submitted and approved prior to construction.
316.22.1	Clarification of thrust restraint requirements	Revise the text to say: - Valves shall be treated as dead-end water mains when establishing thrust-restraint requirements. - Thrust blocks and/or anchor blocks are required at all connections to existing water mains involving tapping sleeves or horizontal/vertical bends adjacent to the connection point.
316.22.3	Joint restraint calculations	Calculations required for pipes 18 inches (18") or larger. Revised from 20".
317.5.3	Tapping sleeves	Added the following sentence to the end of 317.5.3: When tapping sleeves and valves are installed which places the valve within an intersection or in front of the crosswalk, a secondary valve located behind the crosswalk shall be installed.
317.8.3	ACP connections	clarification of ACP connection requirements
317.8.3	ACP connections	Added the following sentence to the end of 317.8.3: Connections to existing ACP made within 6-feet of an existing ACP joint require that section of pipe to be removed and replaced with ductile-iron pipe.

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317.13.1	ARVs	The use of 3-inch piping within the water system is prohibited. When 3-inch ARVs are required, 4-inch ductile-iron supply piping shall be installed between the main and ARV assembly, with a 4-inch by 3-inch flanged reducer installed at the ARV
317.13.2	ARV location	Revised text to say that all vacuum or air/vacuum valves must be above ground
317.14.4	Water meters	delete outdated detail reference
317.14.5	new meter box for meter relocation	Add new sub-section: 317.14.5 Where new service lines are installed, new meter boxes shall be installed and the existing meter shall be relocated to the new meter box.
317.19.4		at all times
317.19.5		Revise text to: Do not place water service lines, hydrants, blowoffs, or meters in driveways, sidewalks, washes, detention basins, or retention basins.
317.19.7	Connection to transmi	Water service connections to transmission mains with diameters 18" and above are not allowed... -- change from 20"
317.19.8	Water services	water services to be perpendicular to roadway centerline
317.22	Water meters	Minor text change - 'purchased' to 'obtained'.
317.27.1	Water meters	Change text to: Acceptable water meter sizes based on instantaneous flow rates are as follows:
317.27.1	Water meters	Change text from 10" water meter to 2-6" fire-rated manifolded Reviewer note: We don't supply or have details for 10" meters.
TBL 3.2		Insert into table: Master Metered Service Connections
TBL 3.2		Insert into table: Reclaimed Water, premises with access to
TBL 3.3	Update backflow table	Update backflow table to include: Double Check Valve Backflow Assembly (DC)
TBL 3.3	Update backflow table	RJ - Revise highlighted text to: In-line booster pumps are OK. Backflow device not required if the entire fire line and sprinkler system is constructed using NSF-61 compliant or certified potable water materials.
317.29.8		Remove Section
317.XX	Identify preferred location for water sampling stations	Inserted appurtenance section for Water Sampling Stations under Section 317: 317.30 Water Sampling Stations: Water sampling stations, when approved for installation, shall be installed per COM Standard Detail xxx. Sampling stations shall be placed a minimum of two feet (2') behind back of curb or sidewalk, and within public right of way or dedicated public water or utility easement. There shall be a minimum clearance of two feet (2') on all sides of the sampling station from any structure, wall, landscape vegetation, or other obstruction.
317.30.4	Location/accessiblity of curb stops and flushing pipes	Renumbered 317.30 to 317.31 Add the following: 317.31.4 Curb stops and flushing pipes shall be accessible at all times and shall not be placed in washes, retention/detention areas, sidewalks, driveways or paved areas.

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Section/Chapter	Topic	Changes
317.31	Water main abandonment	Renumbered to 317.32
Chapter 4	subtitle	minor text modification
401.4	Geotechnical evaluation for sewer installation	Added 401.4 Subsurface Investigations - When requested by Water Resources Department, a geotechnical engineer shall perform a soil investigation to determine the soil bearing capacity, soil backfill suitability, presence of groundwater or bedrock, corrosion potential and other conditions, which may affect the construction of the sewer mains. Test holes shall be located at a maximum spacing of not more than 1,000-feet and at railroad, highway and canal crossings.
402.1	Wastewater master pla	deleted reference to Water Resources Department
402.2	Wastewater master pla	Revised this to point to the web site page for the WW master plan.
407.3	Pavement cuts	Modified Section 407.3 should be consistent with 307.3
414.1	Sewer Design	minor text edits
416.3.	Sewer plans	Replace system components with sewer plan information requirements
418.2	Sewer location	minor text edits
418.3	Sewer location	Minor edits and Add the following language to 418.3: A minimum 6 foot clearance between outside of sewer mains to permanent structures shall be maintained. Additional requirements may apply for new mains constructed within the zone of influence (1:1 horizontal-to-vertical zone extending from the edge of structure footing) of proposed or existing adjacent structures such as traffic signal poles, power poles, buildings, retaining walls, etc.
418.3	Sewer location	Add the following to 418.3: Sewer mains shall not be located less than 5 feet from the edge of the easement without written authorization from the Water Resources Department.
418.3	Sewer Easements	Add the following to 418.3: Easements shall be free of obstructions, shall not be in fenced areas and shall be accessible by City staff at all times. Easements outside of paved areas shall have cross-sectional slopes no greater than 10% and longitudinal slopes no greater than 20%. Easements must be suitable for accommodating vactor and camera trucks weighing over 80,000 lbs. dump trucks, backhoes and other related equipment necessary for the proper maintenance of sewer mains. Minimize planting withing easements in accordance with R18-9-E301 of the Arizona Administrative Code. Re-vegetation within the easement, if required shall consist of low-growing shrubs or plant material acceptable to Water Resources. For dead-end configurations, a hammerhead turnaround or other approved configuration shall be provided. Provide a minimum turn radius of xx feet.
418.4	Sewer access	minor text edits
418.4		Add the following to the end of section 418.4: Maintenance of the access path is the responsibility of the property owner, their representative or governing homeowner's association.
417.6		Revise the text to say that written approval from the Water Resources Department is required.
418.4.2	Sewer Easements/Access	Add access design requirements
418.7.1		Calculations shall be signed and sealed by and Arizona-registered P.E.
418.7.5	Sewer loading	Minor text edits and Created 418.7.6: Sewer mains shall be designed to absorb superimposed live loads and backfill loads without damage to the pipe or adverse effects on pipe hydraulics.

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418.8	Sewer wash crossings	Revise text to: 418.8 Wash Crossings: Sanitary sewer mains, force mains and manholes are not allowed in washes without written approval from the Water Resources Department. Where approved, the following minimum requirements apply: 418.8.1 Manholes shall have bolted, watertight covers. 418.8.2 Rim elevations shall be at least 18 inches above adjacent finished grade. 418.8.3 Perform a scour analysis and provide protection from a 100-year flow event. 418.8.4 Manholes shall be designed to prevent infiltration in wash areas.
419	Sewer Design	Revised title to "Hydraulic Design"
419	Sewer Design	additional hydraulic design criteria to address odor
421.2.2	Sewer Materials	DIP removed
422.2		Revise text with: M.A.G. Specifications Section 610.5.5 and City of Mesa Amendments to M.A.G. Specifications Section 610.5.5.
422.4	Minimum separation b	Revised and reorganized this section regarding minimum separation.
422.6	Sewer service taps	Deleted reference to service taps
423.7	Sewer velocity	Add the following sub-section: 423.7 To minimize odors, surcharging and sewer overflow potential, sewer mains shall be designed so the difference in design velocities in the two intersecting mains is less than 25% of the lowest velocity when flowing 2/3 full.
424.1	Sewer pipe support	Disallow use of DIP in lieu of pipe support.
426.3.1	Sewer velocity	Revise velocity range to: 4 and 7 feet per second (fps).
426.3.2	Sewer Materials	Remove DIP as an option. Sewer to be PVC per AWWA C-900 unless otherwise approved in writing by the Water Resources Department.
426.3.2	Force mains	minor text edits
426.3.5	Pressure test	Updated MAG reference
426.3.8	Force main connections to gravity mains	Added subsection 426.8When a force main connects to a gravity main, the force main shall discharge to a manhole which shall be coated with corrosion resistance epoxy and in compliance with Section 423
430.1.1	Sewer Materials	Remove use of DIP in favor of Polyvinyl Chloride C900 DR25 for structure crossings.
432.3	432.3	Minor text edit and revised the text to say that private connections to public sewer require construction of a new public manhole at the property line. Public sewer main connections to private manholes are prohibited.
432	Drop manholes	Inserted new subsection: Drop manholes are prohibited at intersecting sewer mains. Where required, drop manholes shall be installed upstream of intersecting mains.
TBL 4.4	Manhole spacing	Reduce MH spacing from 1300' to 1000' for MH on pipes > 60" Reviewer Note: Cameras and other maintenance equipment have 1,000' limits.
433.1.1	Manholes	Minor text edit.
433.3	Location of manhole frames/covers	Clarified restriction on location of manhole frames/covers and added: Legal and unobstructed access shall be provided to public manholes on a 24-hour basis. Access routes shall be free and clear to allow vactor trucks, cleaning and camera trucks, and other equipment to drive up to and over each manhole for maintenance and inspection purposes. Access route or path design shall be in accordance with Section 418.3.

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433.4	Polymer concrete MH	Update to allow use of polymer concrete MH in lieu of MH with protective coating
433.7	Approval of drop manholes	Approval to be in writing by the Water Resources Department,
433.7	Clarify use of drop manholes	433.7.4 Drop manholes, where approved shall be in accordance with the following: 2.5-foot to 5-foot drop: Per MAG Standard Detail 426 – Type A. Greater than 5-foot drop: Drop manholes shall be designed and constructed with an inside drop pipe, fiberglass drop bowl and stainless steel 316 pipe support brackets. The design engineer shall provide a detail for review an acceptance by the City. Drop manholes per MAG Standard Detail 426, Type B are prohibited unless approved in writing by the Water Resources Department.
433.9	Clenaouts	Cleanouts prohibited on public sewers
433.10.2	Sewer service connecti	Service line connections shall be installed at angles no greater than 45-degrees as measured from the slope of the sewer main.
433.10.2	Sewer service connecti	Added requirement that approvals be in writing by the Water Resources Department for sewer service connections in manholes.
433.10.3	Sewer service connecti	Tee connections are prohibited.
433.10.5	Sewer service connecti	Prohits service connections to mains 15" in diameter and greater.
433.15		Add new subsection: 433.15 Privately-owned backwater valves, located on private property shall be provided on service connections where the finished floor is less than 12" above the upstream manhole. If currently-adopted plumbing code has more-stringent requirements, code requirements shall govern.
433.16	Grease/Oil Interceptor section added	Add the following new subsection: 433.16 Grease, Oil, and Sand Interceptors/Grease Traps:
434	Add Sewer Infrastructure Abandonment section	New Section. Abandoned sewer must be removed unless under pavement.
705.5	New overhead cable	Owners of active existing overhead cables may over lash up to one fiber optic cable per span pursuant to a written agreement approved by the City Engineer and Council.
708.1	minor clarification	change Permit Services to Development Services
708.3	NCU permitting process	Update text to refer to on-line application system.
709.3	NCU permitting process	Update text to refer to on-line application system.
801.6.2	PRCF department name	Updated deparment name: Parks, Recreation and Community Facilities Department , not Commercial-typ.
806	Underground retention	Material selection for underground storage, especially CMP. Must have acceptable service life based on soils, wall thickness, etc.
814.2	Drywell registration	Update requirement for drywell registration and management. Add new section discussing Aquifer Protection Permit
814.3	Drywell registration	Update reference and requirements. Change section number
814.4	AZPDES	Update to reflect current requirements of ADEQ. Change NOI (Notice of Intent) to ADEQ Authorization/Permit Waiver/No Discharge Certification. Added reference to general stormwater discharge permit. Change section number
Chapter 9	Temporary lighting	New section. Added requirements for temporary lighting when there is a delay between powering off existing and powering on new.
Chapter 9	Adaptive lighting	New section. Added parameters for utilizing adaptive (dimmed) lighting.
907.2	Existing Public Lighting	Lighting Analysis requirements

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907.30	Existing Public Lighting	Limits of analysis reference 906.8.
Section 908	Streetlight Design Standards	Re-numbered per 2019 mid-year upate. This affects subsequent subsections.
908.50	Nodes	Added back in per the 2019 mid-year update.
Section 909	Circuits, Wire & Conductors	Re-organized and clarified per 2019 mid-year update
917.2	Desert Uplands	Fixture requirements updated to match 2019 mid-year update
Section 918	Public Street Lighting	Re-organized and clarified per 2019 mid-year update
919.5	Future Streetlight Locations	To be shown on plans per 2019 mid-year update
1003.2	Solid waste vehicle movement	Clarified restriction of truck from turning while backing